

Two new species of the *Phyto carinata* species-group (Diptera: Rhinophoridae)

by

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ABSTRACT

Two new species of *Phyto* are described from the Western Cape Province, South Africa: *Phyto lactineala* sp. n. and *Phyto royi* sp. n. Both species belong to a monophyletic clade (the *carinata* species-group), now totaling five South African species.

INTRODUCTION

The afrotropical species of *Phyto* were extensively revised by Crosskey (1977). Pape (1987a) described an additional species, *P. carinata*, and also described the males of *P. longirostris* Crosskey and *P. stuckenbergi* Crosskey, which were originally described from one and two females respectively.

Crosskey (1977: 45) considered *P. longirostris* and *P. stuckenbergi* to be 'exceedingly closely related to each other', and Pape (1987a) argued for *carinata*, *longirostris* and *stuckenbergi* making up a monophyletic group, later referring to this group as the *Phyto carinata* species-group (Pape 1992: 53).

The two species of *Phyto* newly described below belong to the *carinata* species-group, as will be further elaborated in the discussion. The *carinata* species-group is interesting as it has a considerable number of autapomorphic features, and a distribution apparently restricted to lowland areas and sea-facing mountain slopes in the southwestern part of South Africa (south of 32°S and west of 22°E). Furthermore, sharing a distinctive morphology with a moderately to greatly elongated proboscis, these species may share some biological features not found in their congeners.

MATERIALS AND METHODS

Specimens were sorted out from material collected during recent Swedish expeditions to South Africa and (with the help of Dr D. Barraclough) from the collections at the Natal Museum. As most major entomological museum collections were searched for afrotropical Rhinophoridae during earlier studies (Pape 1986 1987a,b), no further effort was made of obtaining additional material. Male terminalia were dissected by carefully breaking off the abdomen of the source specimen, soaking in NaOH overnight, pulling out terminalia, washing in tap water, dehydrating in alcohol, and transferring to glycerine. After observation and illustration, abdomen and terminalia were washed in tap water, dehydrated in alcohol,

allowed to dry, and glued to a card pinned with the source specimen. Illustrations were done with a Wild M3Z stereomicroscope for head profiles and other head structures, and a Leitz Laboulx S compound microscope for wings and male terminalia. Both microscopes were equipped with a drawing tube.

KEY TO AFROTROPICAL SPECIES OF THE *PHYTO CARINATA*-GROUP

- 1 Facial plate in upper half with carina (even if rather small); proboscis at least as long as head height; lunule bare; male with reclinate (or latero-reclinate) orbital bristle; base of vein R_{4+5} bare; katepimeron bare.....2
Phyto carinata species-group.....2
- No facial carina present; proboscis shorter than head height; lunule setose; male without reclinate (or latero-reclinate) orbital bristle; base of vein R_{4+5} setulose; katepimeron setoseother species of **Phyto**
- 2 Wing cell r_{4+5} closed at margin or very short petiolate. Notopleuron with some hairlike setae in addition to usual 2 primary bristles. Proboscis about as long as head height.....**stuckenbergi** Crosskey
- Wing cell r_{4+5} broadly open. Notopleuron bare except for usual 2 primary bristles (occasionally with a single setula). Proboscis longer than head height3
- 3 Proboscis very elongate, prementum 1.3 X as long as head height or longer.....4
- Proboscis moderately elongate, prementum subequal to head height.....**carinata** Pape
- 4 Arista plumose. Pedicel atomentose and shining antero-medially. Frons with proclinate orbital bristle in both sexes. Proboscis with prementum 1.3–1.4 X as long as head height. Wing vein M ending freely in membrane. Male wing milky-white. Scutellar apicals directed posteriorly. Female terminalia with strong, flattened bristles apically.....**lactineala** sp. n.
- Arista pubescent. Pedicel sparsely greyish microtomentose. Frons without proclinate orbital bristle in both sexes. Proboscis with prementum 2.0 X as long as head height or longer. Male wing brownish or hyaline. Scutellar apicals directed vertically or at least slanting upwards. Female terminalia not especially modified5
- 5 Facial plate with carina protruding knob-like between pedicels. Scape level with or at most slightly raised above lunule (Fig. 8). Flagellomere 1 about as long as palpus**royi** sp. n.
- Facial plate with shallow carina; not protruding between pedicels. Scape distinctly raised above lunule (Crosskey 1977: fig. 11). Flagellomere 1 longer, 1.7–2.0 X as long as palpus**longirostris** Crosskey

TAXONOMY

Phyto lactineala sp. n.

Figs 1–4

Etymology: *L. lactineus* = milk-like, milk-coloured; *ala* = wing. The species epithet is a composite word to be treated as a noun in apposition and refers to the milky-white appearance of the male wing.

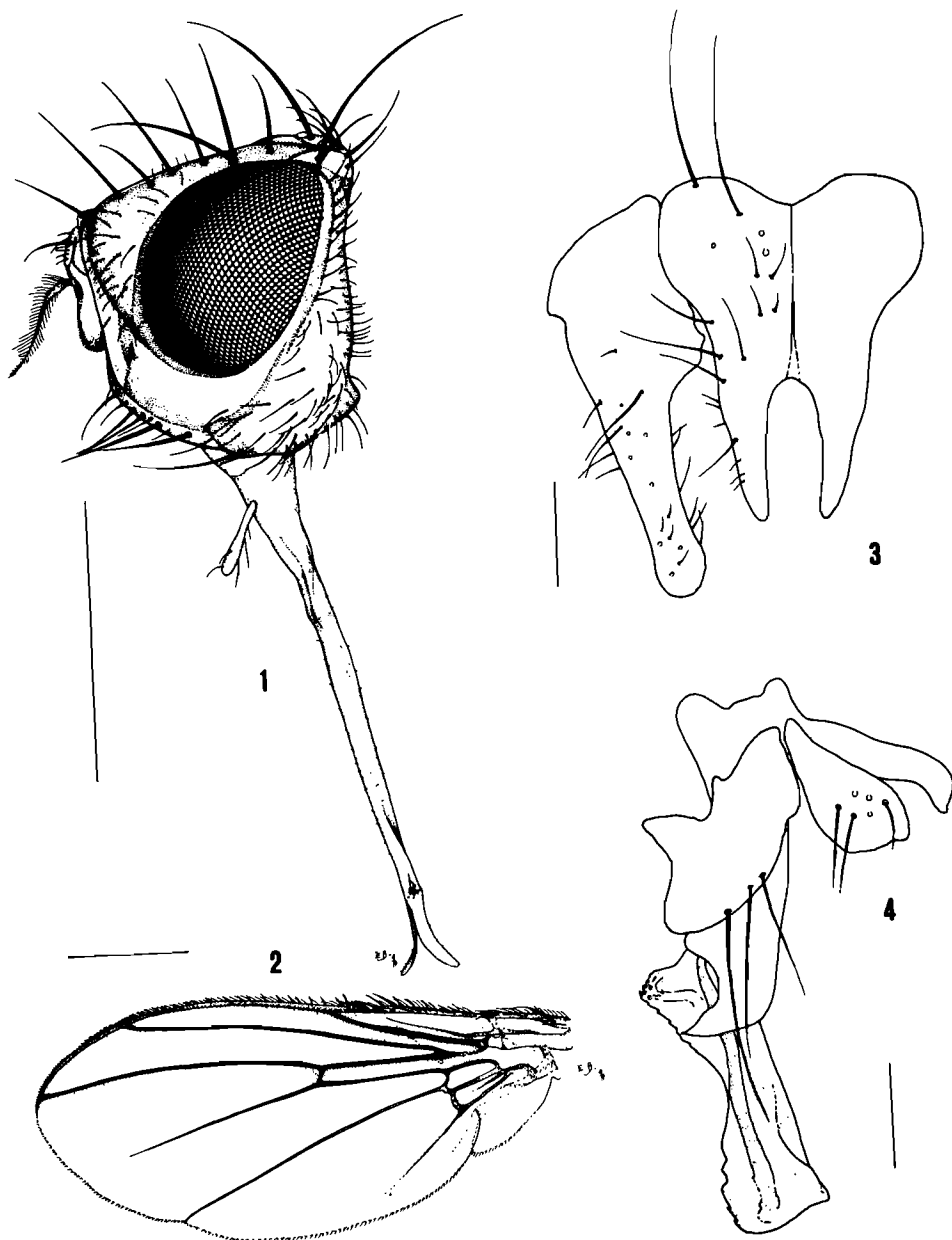
Holotype ♂: SOUTH AFRICA, Western Cape: 'Rep. of South Africa. Cape Province / 10 km S of Citrusdal, Koorlandskloof, / Malaise-trap, S32° 40' E19° 02', / At side of small marsh surrounded by / indigenous shrubs near river. / 7–9.10.1994, Michael Söderlund leg.' [printed label]; 'HOLOTYPE ♂ / *Phyto lactineala* Pape / T.Pape det. 1997' [handwritten, red label]. In the Swedish Museum of Natural History. The holotype is glued with shellac to the pin by its right side, and has the abdomen separately mounted on a piece of card pinned above the locality label; terminalia dissected and mounted dry with abdomen.

Other material examined: Paratype: 1 ♀ locality data and depository as holotype; with yellow label stating its identity as paratype. Left wing of paratype mounted in euparal on separate slide.

Male:

Head: Ground colour black; frontal stripe brownish black; lunule black on posterior half, light brown on anterior half; antenna dark brown to blackish; genal groove brown and sharply contrasted with black parafacial plate and gena; palpus and proboscis dark brown. Fronto-orbital plate, parafacial plate, gena, postgena and lateral parts of postcranium sparsely greyish microtomentose. Head shape as in Fig. 1, almost square, with head at antennal insertion slightly shorter (0.93 X) than head height at vertex, and vibrissal angle slightly behind antennal insertion. Eyes widely separated dorsally, frons at narrowest point 0.35 X greatest head width. Frontal stripe broad, almost parallel, at narrowest 0.63 X width of frons. Inner and outer vertical bristles very strongly developed, situated anteriorly to line of postocular setae and virtually in line with posterior ocelli. A short, medioclinate seta present behind inner vertical. Ocellar bristle as strong as outer vertical, ocellar triangle in addition with scattered setae. Postocellars present, about twice as long as upper postocellar setae. Frontal bristles well developed, row reaching posteriorly to level of proclinate orbital (0.7 X distance from lunule to vertex). Fronto-orbital plate with one proclinate orbital bristle and one latero-reclinate orbital, the latter situated at level of anterior margin of ocellar triangle. Fronto-orbital plate with some occasional, adpressed setulae. Parafacial plate with scattered, adpressed setulae. Facial ridge bare, vibrissal angle with single supravibrissal setula. Vibrissa well developed, 1.17 X as long as flagellomere 1, but slightly shorter and finer than peristomal setae (holotype with only left vibrissa fully intact). Lunule bare. Facial plate with narrow keel in upper part protruding blade-like between (but not beyond) scapes and pedicels. Pedicel seta 1.5 X as long as pedicel; pedicel atomentose and shining brown on antero-median surface. Arista 1.45 X as long as flagellomere 1, plumose virtually along entire length and with longest hairs about 5.0 X as long as greatest arisal diameter. Aristomere 1 not easily discernible, aristomere 2 as broad as long. Genal groove greatly enlarged and encroaching onto parafacial area. Peristomal setae developed. Palpus 1.0 X as long as flagellomere 1; prementum of proboscis elongate and 1.3–1.4 X head height, entire proboscis 1.8 X as long as head height.

Thorax: Ground colour black, dorsum and pleural regions with greyish microtomentum, scutal area with pair of stripes on anterior-most presutural part, otherwise without discernible pattern. Chaetotaxy: humerals = 2, acrostichals = 1 + 1, dorsocentrals = 2 + 3, intra-alars = 1 + 2, supra-alars = 1 (outer posthumeral) + 2,



Figs 1–4. *Phyto lactineala* sp. n. 1. Head profile (♂). 2. Left wing (♀). 3. Cerci and left surstylus, posterior view (vestiture of right cercus omitted). 4. Phallus, gonopod and paramere, left lateral view. Scale bars: Figs 1–2 = 1.0 mm, Figs 3–4 = 0.1 mm.

post-alars = 2. Scutellum with basal, lateral and apical setae; lateral setae strongest (apicals lost in holotype, but size indicated by small sockets). Katepisternal setae: 2; anepimeral setae: 0; katepimeron bare.

Wing membrane hyaline, but densely clothed with whitish microtrichiae giving milky-white appearance. Lower calypter whitish hyaline. Vein M almost straight, with only a very gentle anterior curve at tip and ending freely in wing membrane. Basal node of vein R_{4+5} bare. Costa with stronger setae at regular intervals among ordinary costal setae; costal spine in phase with and almost indistinguishable from stronger costal setae.

Abdomen: Ground colour black, integument covered with thin or sparse microtomentum giving greyish appearance when seen from above and a more dense appearance in anterior view. All tergites laterally with strong marginal and discal setae; median marginals on tergite 3, both discals and median marginals on tergites 4–5. Cerci with prongs distinctly separated, not especially slender; surstylus slightly swollen distally (when seen in profile). Phallus with dorsolateral processes short, free from membrane only at the very tip; median membrane between ventral plates with cuticular pile. Paramere with setae.

Dimensions: Body length: 4.5 mm; wing length: 3.6 mm.

Female:

Similar to male in general appearance but with setae generally somewhat stronger. Facial carina indistinct in frontal view (possibly an artefact from recent emergence and post-mortem shrinkage as the entire upper part of the facial plate plus lunule of the female paratype is somewhat sunken). Scutellum with only a single, median apical seta directed posteriorly (but gently curving upwards). Wings faintly brownish. Anepimeron with 1 long, fine seta and 2 setulae. Terminalia apparently telescopic, with last segment (? epiproct) equipped with 7 large, strong, flattened and upwardly curved bristles.

Dimensions: Body length: 5.3 mm; wing length: 4.5 mm.

***Phyto royi* sp. n.**

Figs 5–9

Etymology: Named after the collector of the type series, Dr Roy Danielsson.

Holotype ♂: SOUTH AFRICA, Western Cape: 'RSA: Cape Prov. De Hoop / Nature Reserve, 0–200 m / 34° 27'S, 20° 25'E, / 10–13.X.1994 loc. 12 / leg. R. Danielsson' [printed label]; 'HOLOTYPE ♂ / *Phyto royi* Pape / T.Pape det. 1997' [handwritten, red label]. In the Zoological Museum, Lund University. The holotype is double-mounted on a rectangular piece of plastic, with the minuten inserted from the right side of the thorax; condition good, with terminalia undissected.

Other material examined: Paratypes: 1♂ 1♀ double-mounted and with same locality data as holotype (♂ with left wing mounted in euparal on separate slide; abdomen glued to card pinned below specimen but above locality label; terminalia dissected and mounted dry with abdomen; in Swedish Museum of Natural History, Stockholm; ♀ in Zoological Museum, Lund University); 1 ♀ double-mounted, SOUTH AFRICA, Western Cape, 15 km SW Bredasdorp on Elim road 3419 DB, 24.ix.1979, J. Londt, flat exposed scrub (in Natal Museum). All paratypes with yellow label stating their identity.

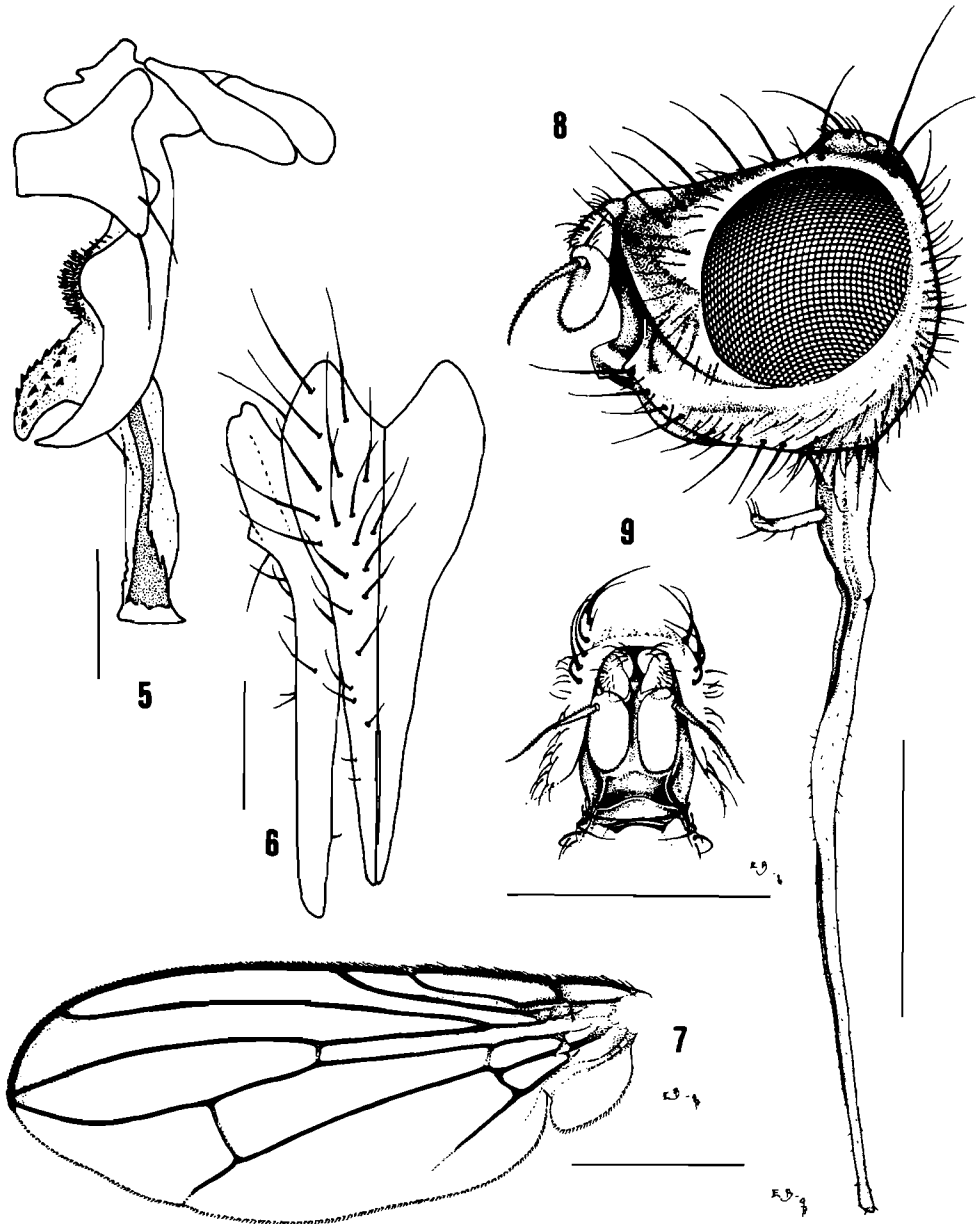
Male:

Head: Ground colour of head inclusive of antenna, palpus and proboscis mainly blackish, but frontal stripe changing from blackish at vertex to brown at lunule, and entire genal groove light brown. Fronto-orbital plate, parafacial plate, gena, postgena and lateral parts of postcranium sparsely greyish microtomentose. Head shape as in Fig. 8, almost trapezoidal, with head at antennal insertion slightly longer (1.07 X) than head height at vertex, and vibrissal angle slightly behind antennal insertion. Eyes widely separated dorsally, frons at narrowest point 0.37 X greatest head width. Frontal stripe broad, at narrowest 0.53 X width of frons. Inner and outer vertical bristles well developed, situated anterior to line of postocular setae and almost in line with posterior ocelli. A short, medio-clinate seta present behind inner vertical. Ocellar bristle as strong as outer vertical, ocellar triangle in addition with scattered setae. Postocellars present, 1.5 X as long as upper postocellar setae. Frontal bristles well developed, row reaching posteriorly about to narrowest part of frons (0.7 X distance from lunule to vertex). Fronto-orbital plate with one latero-reclinate orbital bristle at level of anterior margin of ocellar triangle. Fronto-orbital plate with additional setae of irregular size forming an ill-defined row. Parafacial plate with scattered setae. Facial ridge bare, vibrissal angle with a single supravibrissal setula. Vibrissa well developed, 1.25 X as long as flagellomere 1. Lunule bare. Facial plate with distinct, rounded keel in upper part, protruding knob-like between (but not beyond) antennal pedicels. Antennal pedicel sparsely greyish microtomentose, pedicel seta 0.8 X as long as pedicel. Flagellomere 1 twice as long as pedicel. Arista 1.58 X as long as flagellomere 1, short pubescent with longest hairs about 0.75 X greatest arisal diameter. Aristomere 1 not easily discernible, aristomere 2 as broad as long. Genal groove greatly enlarged. Peristomal setae developed. Palpus 1.17 X as long as flagellomere 1; prementum of proboscis greatly attenuated and 2.2 X head height.

Thorax: Ground colour blackish, dorsum and pleural regions with greyish microtomentum, scutal area with a weakly developed pattern of 3 longitudinal stripes. Chaetotaxy: humerals = 2, acrostichals = 1 + 1, dorsocentrals = 2 + 3, intra-alars = 1 + 2, supra-alars = 1 (outer posthumeral) + 2, post-alars = 2. Scutellum with strong basal setae and a pair of apicals, the former reaching beyond the latter; apical setae directed upwards (from almost vertically in holotype and ♀ paratypes to about 60° in ♂ paratype). Katepisternal setae: 2; anepimeral setae: 1–2; katepimeron bare.

Wing and lower calypter hyaline. Bend of vein M widely obtuse and gradual, almost a gentle curve. Cell r_{4+5} broadly open. Basal node of vein R_{4+5} bare. Costal spine as long as but more robust than adjacent costal setae; costal setae otherwise uniformly developed.

Abdomen: Ground colour black, integument covered with thin or sparse microtomentum giving a greyish impression when seen from above and a more dense, silvery appearance in anterior view. A weak median stripe may be seen from some angles. All tergites laterally with strong marginal and discal setae; median marginals only on tergite 5. Cerci with prongs distinctly adpressed, slender; surstylus with prong rather slender, gradually tapering distally. Phallus with dorsolateral processes of medium length, free from membrane for considerable distance; median membrane between ventral plates with cuticular pile. Paramere without setae.



Figs 5–9. *Phyto royi* sp. n. 5. Phallus, gonopod and paramere, left lateral view. 6. Cerci and left surstylus, posterior view (vestiture of right cercus omitted). 7. Left wing (♂). 8. Head profile (♂). 9. Front part of head, anterior view (♂). Scale bars: Figs 5–6 = 0.1 mm, Figs 7–9 = 1.0 mm.

Dimensions: Body length: 5.0 mm; wing length: 4.0 mm.

Female:

Very similar to male. Terminalia of one ♀ paratype partly extended, of the telescopic type and with no remarkable modifications.

Dimensions: Body length: 3.5 mm; wing length: 2.8 mm.

DISCUSSION

It is possible on the present morphological evidence to provide a first hypothesis on the phylogenetic relationships between the five species included in the *carinata* species-group. Choosing the European *Phyto melanocephala* (Pandellé, 1896) as outgroup and scoring the characters outlined in Table 1, a parsimony analysis may be carried out manually (or by any program in current use), here resulting in the cladogram shown in Fig. 10.

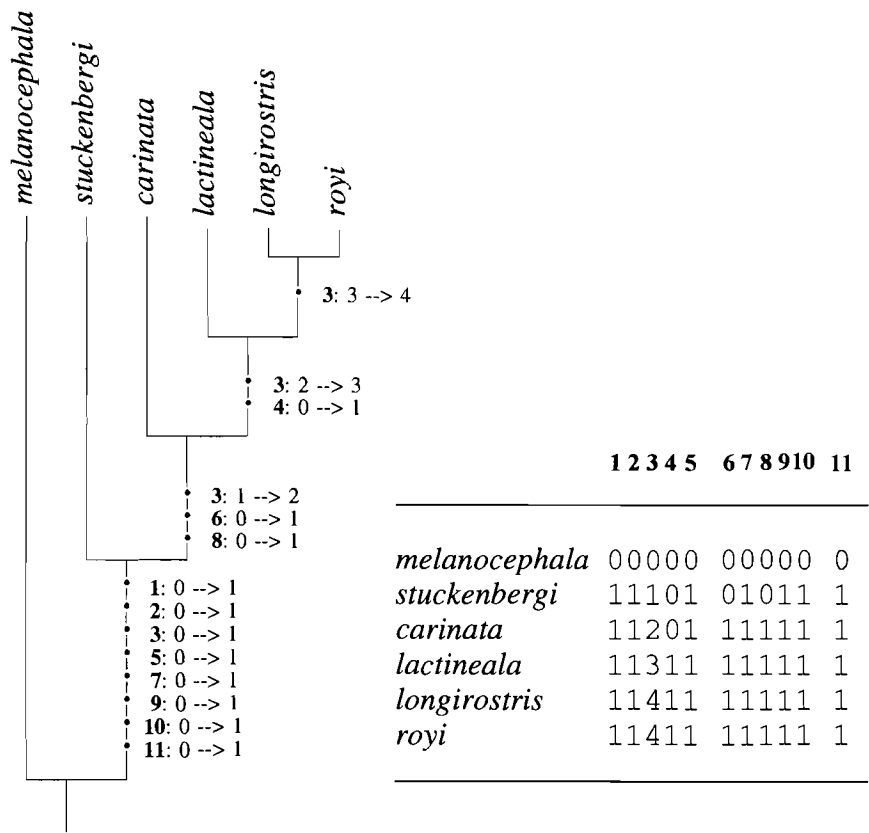


Fig. 10. Cladogram showing phylogenetic relationships within *carinata* species-group and character state changes along branches; also character matrix with scorings of terminal taxa. For explanation of characters see Table 1.

The *carinata* species-group emerges as monophyletic, defined by a remarkable number of character states not shared with other species of *Phyto* (here represented solely by *P. melanocephala*) and apparently apomorphic at this level:

- Facial carina developed (even if weak in *longirostris* and *stuckenbergi*);
- Lunule bare;
- Proboscis elongate and about as long as head height;
- Katepimeron bare;
- No setulae at base of vein R_{4+5} ;
- Acrophallus elongate;
- Phallic dorsolateral processes short;
- Membrane between phallic ventral processes with cuticular pile.

Phyto stuckenbergi appears to be the phylogenetically most basal species within the *carinata* species-group, and *P. carinata* may be the sister group of the three remaining species; *lactineala*, *longirostris*, and *royi*. Phylogenetic relationships between the latter three depend on the interpretation of character 3: length of proboscis. If states are considered as forming parts of a linear transformation series, reflecting a gradual lengthening of the proboscis, the relationship between the three species is resolved as in Fig. 10. An alternative view could be to consider states as discrete, topographically correspondent variables, in which case states should be treated as unordered. With this coding there would be no phylogenetic information and the three species would form an unresolved trichotomy.

TABLE 1
Characters and character states used in the phylogenetic analysis of the *carinata* species-group
(see Fig. 10).

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- | | |
|-----|--|
| 1. | Facial plate with upper part gently convex, not produced into a carina (0); produced into a carina (1) |
| 2. | Lunule setose (0); bare (1) |
| 3. | Proboscis shorter than head height (0); as long as head height (1); elongated with prementum as long as head height (2); elongated with prementum 1.3 X head height (3); elongated with prementum 2.0 X as long as head height or more (4) |
| 4. | Proboscis with labellar lobes subequal to palpus (0); elongate and longer than palpus (1) |
| 5. | Notopleuron setulose in addition to the usual primary bristles (0); bare (1) |
| 6. | Katepimeron setulose (0); bare (1) |
| 7. | Base of vein R_{4+5} setulose (0); bare (1) |
| 8. | Wing cell m_{1+2} narrowly open or closed (0); broadly open (1) |
| 9. | Acrophallus not elongate (0); elongate (1) |
| 10. | Phallic dorsolateral processes long (0); short (1) |
| 11. | Membrane between phallic ventral processes bare (0); with cuticular pile (1) |
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It should be noted that a proper rooting of the *carinata* species-group within the genus *Phyto* will necessitate a much more inclusive study, which is beyond the scope of the present paper.

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